

Database Objects

Object	Description
Table	Basic unit of storage; composed of rows
View	Logically represents subsets of data from one or more tables
Sequence	Generates numeric values
Index	Improves the performance of data retrieval queries
Synonym	Gives alternative names to objects



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Database Objects

There are several other objects in a database in addition to tables.

With views, you can present and hide data from the tables.

Many applications require the use of unique numbers as primary key values. You can either build code into the application to handle this requirement or use a sequence to generate unique numbers.

If you want to improve the performance of data retrieval queries, you should consider creating an index. You can also use indexes to enforce uniqueness on a column or a collection of columns.

You can provide alternative names for objects by using synonyms.

What Is a View?

EMPLOYEES table

EMPLOYEE_ID	FIRST_NAME	LAST_NAME	EMAIL	PHONE_NUMBER	HIRE_DATE	JOB_ID	SALARY
100	Steven	King	SKING	515.123.4567	17-JUN-87	AD_PRES	24000
101	Neena	Kochhar	NKOCHHAR	515.123.4568	21-SEP-89	AD_VP	17000
102	Lex	De Haan	LDEHAAN	515.123.4569	13-JAN-93	AD_VP	17000
103	Alexander	Hunold	AHUNOLD	590.423.4567	03-JAN-90	IT_PROG	9000
104	Bruce	Ernst	EERNST	590.423.4568	01-MAY-93	SA_MAN	6000
105	Shelley	Higgins	SHIGGINS	515.123.8080	07-JUN-94	AC_MGR	12000
106	William	Gietz	WGIETZ	515.123.8181	07-JUN-94	AC_ACCOUNT	8300

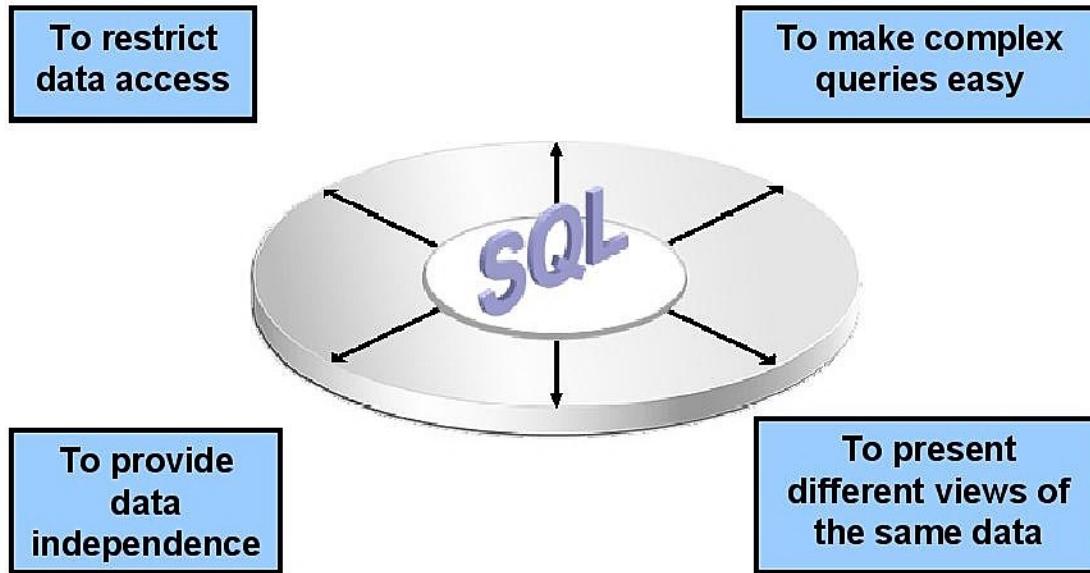
EMPLOYEE_ID	FIRST_NAME	LAST_NAME	SALARY
100	Steven	King	24000
101	Neena	Kochhar	17000
102	Lex	De Haan	17000
103	Alexander	Hunold	9000
104	Bruce	Ernst	6000
105	Shelley	Higgins	10500
106	William	Gietz	11000

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What Is a View?

You can present logical subsets or combinations of data by creating views of tables. A view is a logical table based on a table or another view. A view contains no data of its own, but is like a window through which data from tables can be viewed or changed. The tables on which a view is based are called *base tables*. The view is stored as a SELECT statement in the data dictionary.

Advantages of Views



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Advantages of Views

- Views restrict access to the data because it displays selected columns from the table.
- Views can be used to make simple queries to retrieve the results of complicated queries. For example, views can be used to query information from multiple tables without the user knowing how to write a join statement.
- Views provide data independence for ad hoc users and application programs. One view can be used to retrieve data from several tables.
- Views provide groups of users access to data according to their particular criteria.

For more information, see the “CREATE VIEW” section in *Oracle Database SQL Language Reference* for 10g or 11g database.

Simple Views and Complex Views

Feature	Simple Views	Complex Views
Number of tables	One	One or more
Contain functions	No	Yes
Contain groups of data	No	Yes
DML operations through a view	Yes	Not always



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Simple Views and Complex Views

There are two classifications for views: simple and complex. The basic difference is related to the DML (INSERT, UPDATE, and DELETE) operations.

- A simple view is one that:
 - Derives data from only one table
 - Contains no functions or groups of data
 - Can perform DML operations through the view
- A complex view is one that:
 - Derives data from many tables
 - Contains functions or groups of data
 - Does not always allow DML operations through the view

Creating a View

- You embed a subquery in the CREATE VIEW statement:

```
CREATE [OR REPLACE] [FORCE | NOFORCE] VIEW view
  [(alias[, alias]...)]
  AS subquery
  [WITH CHECK OPTION [CONSTRAINT constraint]]
  [WITH READ ONLY [CONSTRAINT constraint]];
```

- The subquery can contain complex SELECT syntax.



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Creating a View

You can create a view by embedding a subquery in the CREATE VIEW statement.

In the syntax:

OR REPLACE	Re-creates the view if it already exists
FORCE	Creates the view regardless of whether or not the base tables exist
NOFORCE	Creates the view only if the base tables exist (This is the default.)
<i>view</i>	Is the name of the view
<i>alias</i>	Specifies names for the expressions selected by the view's query (The number of aliases must match the number of expressions selected by the view.)
<i>subquery</i>	Is a complete SELECT statement (You can use aliases for the columns in the SELECT list.)
WITH CHECK OPTION	Specifies that only those rows that are accessible to the view can be inserted or updated
<i>constraint</i>	Is the name assigned to the CHECK OPTION constraint
WITH READ ONLY	Ensures that no DML operations can be performed on this view

Note: In SQL Developer, click the Run Script icon or press [F5] to run the data definition language (DDL) statements. The feedback messages will be shown on the Script Output tabbed page.

Creating a View

- Create the EMPVU80 view, which contains details of the employees in department 80:

```
CREATE VIEW empvu80
AS SELECT employee_id, last_name, salary
   FROM employees
 WHERE department_id = 80;
```

CREATE VIEW succeeded.

- Describe the structure of the view by using the SQL*Plus DESCRIBE command:

```
DESCRIBE empvu80
```

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Creating a View (continued)

The example in the slide creates a view that contains the employee number, last name, and salary for each employee in department 80.

You can display the structure of the view by using the DESCRIBE command.

Name	Null	Type
EMPLOYEE_ID	NOT NULL	NUMBER(6)
LAST_NAME	NOT NULL	VARCHAR2(25)
SALARY		NUMBER(8,2)

Guidelines

- The subquery that defines a view can contain complex SELECT syntax, including joins, groups, and subqueries.
- If you do not specify a constraint name for the view created with the WITH CHECK OPTION, the system assigns a default name in the SYS_Cn format.
- You can use the OR REPLACE option to change the definition of the view without dropping and re-creating it, or regranting the object privileges previously granted on it.

Creating a View

- Create a view by using column aliases in the subquery:

```
CREATE VIEW salvu50
AS SELECT employee_id ID_NUMBER, last_name NAME,
           salary*12 ANN_SALARY
      FROM employees
     WHERE department_id = 50;
CREATE VIEW succeeded.
```

- Select the columns from this view by the given alias names.

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Creating a View (continued)

You can control the column names by including column aliases in the subquery.

The example in the slide creates a view containing the employee number (EMPLOYEE_ID) with the alias ID_NUMBER, name (LAST_NAME) with the alias NAME, and annual salary (SALARY) with the alias ANN_SALARY for every employee in department 50.

Alternatively, you can use an alias after the CREATE statement and before the SELECT subquery. The number of aliases listed must match the number of expressions selected in the subquery.

```
CREATE OR REPLACE VIEW salvu50 (ID_NUMBER, NAME, ANN_SALARY)
AS SELECT employee_id, last_name, salary*12
      FROM employees
     WHERE department_id = 50;
CREATE VIEW succeeded.
```

Retrieving Data from a View

```
SELECT *  
FROM salvu50;
```

	ID_NUMBER	NAME	ANN_SALARY
1	124	Mourgos	69600
2	141	Rajs	42000
3	142	Davies	37200
4	143	Matos	31200
5	144	Vargas	30000

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Retrieving Data from a View

You can retrieve data from a view as you would from any table. You can display either the contents of the entire view or just specific rows and columns.

Modifying a View

- Modify the EMPVU80 view by using a CREATE OR REPLACE VIEW clause. Add an alias for each column name:

```
CREATE OR REPLACE VIEW empvu80
  (id_number, name, sal, department_id)
AS SELECT employee_id, first_name || ' '
      || last_name, salary, department_id
    FROM employees
   WHERE department_id = 80;
CREATE OR REPLACE VIEW succeeded.
```

- Column aliases in the CREATE OR REPLACE VIEW clause are listed in the same order as the columns in the subquery.

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Modifying a View

With the OR REPLACE option, a view can be created even if one exists with this name already, thus replacing the old version of the view for its owner. This means that the view can be altered without dropping, re-creating, and regranting object privileges.

Note: When assigning column aliases in the CREATE OR REPLACE VIEW clause, remember that the aliases are listed in the same order as the columns in the subquery.

Creating a Complex View

Create a complex view that contains group functions to display values from two tables:

```
CREATE OR REPLACE VIEW dept_sum_vu
  (name, minsal, maxsal, avgsal)
AS SELECT      d.department_name, MIN(e.salary),
                MAX(e.salary), AVG(e.salary)
  FROM        employees e JOIN departments d
  ON          (e.department_id = d.department_id)
 GROUP BY    d.department_name;
CREATE OR REPLACE VIEW succeeded.
```



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Creating a Complex View

The example in the slide creates a complex view of department names, minimum salaries, maximum salaries, and the average salaries by department. Note that alternative names have been specified for the view. This is a requirement if any column of the view is derived from a function or an expression.

You can view the structure of the view by using the DESCRIBE command. Display the contents of the view by issuing a SELECT statement.

```
SELECT  *
FROM    dept_sum_vu;
```

#	NAME	MINSAL	MAXSAL	AVGSAL
1	Administration	4400	4400	4400
2	Accounting	8300	12000	10150
3	IT	4200	9000	6400
4	Executive	17000	24000	19333.333333333...
5	Shipping	2500	5800	3500
6	Sales	8600	11000	10033.333333333...
7	Marketing	6000	13000	9500

Rules for Performing DML Operations on a View

- You can usually perform DML operations on simple views.
- You cannot remove a row if the view contains the following:
 - Group functions
 - A GROUP BY clause
 - The DISTINCT keyword
 - The pseudocolumn ROWNUM keyword



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Rules for Performing DML Operations on a View

- You can perform DML operations on data through a view if those operations follow certain rules.
- You can remove a row from a view unless it contains any of the following:
 - Group functions
 - A GROUP BY clause
 - The DISTINCT keyword
 - The pseudocolumn ROWNUM keyword

Rules for Performing DML Operations on a View

You cannot modify data in a view if it contains:

- Group functions
- A GROUP BY clause
- The DISTINCT keyword
- The pseudocolumn ROWNUM keyword
- Columns defined by expressions



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Rules for Performing DML Operations on a View (continued)

You can modify data through a view unless it contains any of the conditions mentioned in the previous slide or columns defined by expressions (for example, SALARY * 12).

Rules for Performing DML Operations on a View

You cannot add data through a view if the view includes:

- Group functions
- A GROUP BY clause
- The DISTINCT keyword
- The pseudocolumn ROWNUM keyword
- Columns defined by expressions
- NOT NULL columns in the base tables that are not selected by the view



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Rules for Performing DML Operations on a View (continued)

You can add data through a view unless it contains any of the items listed in the slide. You cannot add data to a view if the view contains NOT NULL columns without default values in the base table. All the required values must be present in the view. Remember that you are adding values directly to the underlying table *through* the view.

For more information, see the “CREATE VIEW” section in *Oracle Database SQL Language Reference* for 10g or 11g database.

Using the WITH CHECK OPTION Clause

- You can ensure that DML operations performed on the view stay in the domain of the view by using the WITH CHECK OPTION clause:

```
CREATE OR REPLACE VIEW empvu20
AS SELECT      *
   FROM employees
  WHERE department_id = 20
    WITH CHECK OPTION CONSTRAINT empvu20_ck ;
CREATE OR REPLACE VIEW succeeded.
```

- Any attempt to INSERT a row with a department_id other than 20, or to UPDATE the department number for any row in the view fails because it violates the WITH CHECK OPTION constraint.



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Using the WITH CHECK OPTION Clause

It is possible to perform referential integrity checks through views. You can also enforce constraints at the database level. The view can be used to protect data integrity, but the use is very limited.

The WITH CHECK OPTION clause specifies that INSERTs and UPDATEs performed through the view cannot create rows that the view cannot select. Therefore, it enables integrity constraints and data validation checks to be enforced on data being inserted or updated. If there is an attempt to perform DML operations on rows that the view has not selected, an error is displayed, along with the constraint name if that has been specified.

```
UPDATE empvu20
   SET department_id = 10
  WHERE employee_id = 201;
```

causes:

```
Error report:
SQL Error: ORA-01402: view WITH CHECK OPTION where-clause violation
01402. 00000 -  "view WITH CHECK OPTION where-clause violation"
```

Note: No rows are updated because, if the department number were to change to 10, the view would no longer be able to see that employee. With the WITH CHECK OPTION clause, therefore, the view can see only the employees in department 20 and does not allow the department number for those employees to be changed through the view.

Denying DML Operations

- You can ensure that no DML operations occur by adding the WITH READ ONLY option to your view definition.
- Any attempt to perform a DML operation on any row in the view results in an Oracle server error.



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Denying DML Operations

You can ensure that no DML operations occur on your view by creating it with the WITH READ ONLY option. The example in the next slide modifies the EMPVU10 view to prevent any DML operations on the view.

Denying DML Operations

```
CREATE OR REPLACE VIEW empvu10
  (employee_number, employee_name, job_title)
AS SELECT      employee_id, last_name, job_id
   FROM        employees
  WHERE      department_id = 10
    WITH READ ONLY ;
CREATE OR REPLACE VIEW succeeded.
```

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Denying DML Operations (continued)

Any attempt to remove a row from a view with a read-only constraint results in an error:

```
DELETE FROM empvu10
WHERE employee_number = 200;
```

Similarly, any attempt to insert a row or modify a row using the view with a read-only constraint results in the same error.

```
Error report:
SQL Error: ORA-42399: cannot perform a DML operation on a read-only view
```

Removing a View

You can remove a view without losing data because a view is based on underlying tables in the database.

```
DROP VIEW view;
```

```
DROP VIEW empvu80;
```

```
DROP VIEW empvu80 succeeded.
```

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Removing a View

You use the `DROP VIEW` statement to remove a view. The statement removes the view definition from the database. However, dropping views has no effect on the tables on which the view was based. Alternatively, views or other applications based on the deleted views become invalid. Only the creator or a user with the `DROP ANY VIEW` privilege can remove a view.

In the syntax, `view` is the name of the view.

Practice 11: Overview of Part 1

This practice covers the following topics:

- Creating a simple view
- Creating a complex view
- Creating a view with a check constraint
- Attempting to modify data in the view
- Removing views



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Practice 11: Overview of Part 1

Part 1 of this lesson's practice provides you with a variety of exercises in creating, using, and removing views. Complete questions 1–6 at the end of this lesson.

Lesson Agenda

- Overview of views:
 - Creating, modifying, and retrieving data from a view
 - DML operations on a view
 - Dropping a view
- Overview of sequences:
 - Creating, using, and modifying a sequence
 - Cache sequence values
 - NEXTVAL and CURRVAL pseudocolumns
- Overview of indexes
 - Creating, dropping indexes
- Overview of synonyms
 - Creating, dropping synonyms

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